Managing Towards the Gold Standard—Ecological Values of Second Growth Small Woodlands on Vancouver Island

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Abstract
The area south of Campbell River on eastern Vancouver Island encompasses several of the most threatened ecosystems in the Georgia Basin. Unique in BC most of this region, extensively altered through settlements, logging, agriculture or mining, is in private hands. The level of ecological disturbance is high. The BC Conservation Data Centre has red or blue listed 39 plant communities within the Campbell River Forest District alone. Academia, government and the environmental community have focused on protecting the few remaining intact plant communities, (i.e. <1% of the original coastal Douglas fir ecosystems) or on the environmental and forest practices on the large tracts owned by forest companies. Very little research or public policy effort has been directed to the importance of the large number of small scale private woodlots, typically family owned 5 to 100 hectares of second growth forest. I intend to present research (including case studies of "best practices"), first to demonstrate that these small woodlands have important, if not yet widely recognized, ecological and socio-economic values within the Georgia Basin Ecosystem; and second that there are serious institutional and economic barriers which mitigate against implementing idealized "eco-forestry" practices.

With only vestigial remnants of old-growth Douglas fir forests remaining within the Georgia Basin/Puget Sound Ecosystem, increasingly recognition is being given to the importance of second-growth forests in maintaining biodiversity, including developing best practices to actively manage these forests toward old-growth characteristics. Research in this area focussed at the scale of industrial forestry operations. Little attention has been given to small woodlands, a common feature and an important component of the present day ecosystem of south eastern Vancouver Island and the Gulf Islands. Like the large corporately owned forests, these small privately owned second-growth stands are now at a harvestable age and near-term management decisions, influenced by a log market which pays a premium for export grade 80-100 year old Douglas fir, will have an important impact on the ecosystem's near and longer term biodiversity.

Old-growth Ideals and Second-growth Realties
More than a half-century after the great Douglas fir forests in the Georgia Basin/Puget Sound region were logged out, conservationists and scientists alike, drawn by the "metaphysics" of old-growth forests, make the case that it should be regarded as a non-renewable resource (Carey 1998). Old-growth is a potent symbol in our cultural landscapes and unlike Europe or Asia, our ideal of wilderness would exclude human presence. We therefore tend to view the preservation of the ancient old-growth forests, untouched and unoccupied, with almost moral virtue.

Yet the region's forest ecological history has been anything but static. The forests on the southern half of the east coast of Vancouver Island and in Puget Sound have constantly altered with climactic changes (Brubaker 1991). The Garry-oak maximum, a dry-warm climactic period of Douglas fir forests and frequent fires, which ended 7,000 years ago, preceded wetter and cooler intervals dominated by western hemlock and western red cedar. This period ended 2,000 years ago, and a warmer interval began that was marked by extensive fires. There is evidence of anthropogenic sources of fire playing an important role in establishing and re-establishing Douglas fir forests at the time of European arrival. Our cultural mythology of a natural Eden of great Douglas fir forests and verdant Garry-oak meadows is at odds with a landscape managed by First Nations with fire to encourage camas, bracken fern, black-tailed deer and other food sources.

But the scale and the speed of anthropogenic disturbances over the last 100 years are qualitatively different from anything in the past. The Canada/BC Sensitive Ecosystems Inventory of East Vancouver and Gulf Islands (Ward *et al.* 1998) found that fully half the studied plant communities are endangered (red-listed). The rest are threatened (blue-listed). The inventory found less than 4 percent of the area covered by the original coastal Douglas fir forests of 150 years ago is still occupied by relatively undisturbed older forest ecosystems, even when the definitional criteria was only stands with an age-class greater than 100 years old (McPhee *et al.* 2000). Clearly academic researchers, government agencies and non-governmental organizations are correct in their concerns to identify and protect surviving examples of threatened or distinct natural plant communities and wildlife habitats.

Unfortunately, in south eastern Vancouver Island and the Gulf Islands, initiatives in ecological conservation are constrained as much by patterns of land ownership as by the degree of habitat disturbance from settlement, logging and agriculture activities of the last 150 years. Unlike much of British Columbia, this region has little land in public ownership, a situation that has complicated the establishment of protected areas. Existing (and prospective) protected areas are small and fragmented. They can provide only limited protection to endangered plant communities and may be unsuitable for the long-term viability of rare plant and animal species requiring either large geographic areas, connectivity of habitats, or spatial or seral diversity (Nelson 1999). There is very little opportunity to protect large areas of undisturbed older forests. On the other hand, more than 56% of the mapped area of inventoried sensitive ecosystems are older second-growth forests. With a minimum age of 60 years, these stands are poised to begin developing characteristics of old-growth forests (McPhee *et al*. 2000).

The paucity of surviving Coastal Douglas fir old-growth forests means we need to review our cultural paradigm of conservation as primarily preservation of undisturbed ecosystems. The potential application of current research on old-growth development points to the conservation values in actively managing second-growth toward old-growth characteristics (Blackwell *et al*. 2002; Klinka *et a*l. 1990; Spies *et al*. 2001). This field of research is directed to industrial forestry practices on public or private lands. As yet there is no published research in this area on applications to small second-growth woodlands, even though on south eastern Vancouver Island these are an important landscape component of the ecosystem. In this paper I will demonstrate, with a case study that small privately owned woodlands can possess distinctive ecological values and offer opportunities for biodiversity management separate from ecologically sound forestry practices being researched for larger scale industrial operations.

Comox Valley—Ecological Background

The Comox Valley, centred on the eastern coast of Vancouver Island, has an area of 170,000 hectares. Bounded on the east by the Strait of Georgia, it is the northern limit of the Coastal Douglas fir biogeoclimatic zone as it merges into the Coastal Western Hemlock (very dry maritime) zone. To the west, the Valley rises sharply to the Beaufort Range and Forbidden Plateau. Increasing precipitation and cooler temperatures cause another transition: to the Mountain Hemlock biogeoclimatic zone, to sub-alpine parkland above 1400 metres, and to glaciers at 1700 metres. Separating the Beaufort Range from Forbidden Plateau is the watershed of Comox Lake and the upper Puntledge River. This low elevation drainage extends west into the wetter sub zones of the Coastal Western Hemlock biogeoclimatic zone.

Intensive logging began in the Comox Valley just prior to World War I with the formation of the Comox Valley Logging and Railway Company (Mackie 2000). Each year from 1910 to1940, 100,000,000 board feet of timber 400,000 cubic metres) was cut and boomed to the Fraser Mills from a forest dominated by old-growth Douglas fir. The even-aged stands were the result of an enormous fire in 1668 (Laroque *et al*. 1999; Schmidt 1957). Vestiges of old-growth Douglas fir stands survived after World War II, for example, at elevations above 700 metres on the eastern edge of Forbidden Plateau (Hardy 1954). Today these forests are gone, replaced by farms, clear cuts, and the second-growth forest that developed after massive fires in the1920s and 1930s. Of the 108,000 hectares within the Comox-Strathcona Regional District included in the Sensitive Ecosystem Inventory (Ward *et al*. 1998), only 1117 hectares was found to be forest older than 100 years (with no stands older than 250 years).

Other than the largely montane to alpine Strathcona Provincial Park and a few small protected areas, most land in the Valley is privately owned. Large tracts are held by the forest companies, which are successors to the 1886 E&N Railway land grant (Isenor *et al.* 1987). There are also over 20,000 hectares, half of which is forested, of privately owned non-industrial land parcels larger than 8 hectares (NIWA 1994). Typically these are family-owned parcels under 100 hectares in size. Although most have harvestable second-growth, few of these woodlands are being actively managed for timber production. The effects of this pattern of land holding on the biodiversity at the different scales of a landscape and small woodland within that landscape need to be kept in mind.

Landscape Ecology

This paper presents the results of a largely descriptive research program that focuses on a 40-acre privately owned woodland within a “Study Landscape” of about 16 square kilometres in the Comox Valley. The Study Landscape can be described as a sloping bench bordered on its east edge (elevation 140 metres) by the low coastal Comox Plain, and rising west for a distance of 4 kilometres to an elevation of 960 metres where it merges into Forbidden Plateau. The southern and northern boundaries are delineated by valleys formed by Comox Lake and the Browns River. Although the Study Area is in the Coastal Western Hemlock (very dry maritime & moist maritime) biogeoclimatic sub zones, there is an increasing influence from the Mountain Hemlock biogeoclimatic zone with increases in elevation. There are several creeks draining the landscape, some of which are seasonal. By 1925, the original Douglas fir forest had been railway logged and allowed to naturally regenerate. Most of the landscape is private forestland, the largest portion owned by a single forest company that commenced clear cutting patches of second-growth in the late 1970s, followed by replanting with Douglas fir. There are several woodlands that vary from 12 to several hundred hectares and one woodlot licensee (private and Crown owned lands managed as a single unit).

Tree species composition varies by site. In general western hemlock (*Tsuga heterophylla*) and Douglas fir (*Pseudotsuga menziesii*) are the dominant species although western red cedar (*Thuja plicata*) is well represented. The lower moister sites, where black cottonwood (*Populus balsamitera*) and flowering dogwood (*Cornus nuttallii*) are found, are most productive. Red alder (*Alnus rubra*) is found along streams and on the degraded soils of the old railroad grades. The ridges generally have a summer moisture deficit. Arbutus (*Arbutus menziesii*) and shore pine (*Pinus contorta var. contorta*) are found on southern exposed outcrops at lower elevations; western pine white pine (*Pinus monticola*), amabilis fir (*Abies amabilis)* and subalpine fir (*Abies lasiocarpa*) occur above 400 metres; and yellow-cedar (*Chamaecyparis nootkatensis*) grows above 600 metres.

The Study Landscape borders three distinct habitats, each having sites with rare plants communities (Douglas *et al*. 2002). The southern boundary includes the Ecological Reserve on the Comox Lake Bluffs. Moderated by a large ice-free lake, this dry-site plant community, typical of the Coastal Douglas fir biogeoclimatic zone to the south, has arbutus, hairy manzanita (*Arctostaphylos*) and the blue-listed least moonwort (*Botrychium simplex*). Riparian and wetland plant communities are well represented in the low Comox Plain, including the only known occurrence in Canada of the western wahoo (*Eunonymus occidentalis*) which is found in second-growth private woodland. To the west on Forbidden Plateau, an eastern extension of Strathcona Provincial Park is the sub-alpine plant community on Mount Beecher, the only site in Canada of the Olympic onion (*Allium crenulatum*).

Second-growth forests are also recognized as having important wildlife values as habitats for some species and for connectivity of habitats for other species. The Study Landscape is no exception. For example, black bears feed in spring in low elevation wetlands, then forage in summer first in second-growth western hemlock woodlands for truffles and then in clear cuts for red huckleberry before moving in late summer to higher elevations to feed on blueberries and salmon berries. Of greater interest are observations by the author and others (Hopwood 1997) of species normally associated with old-growth habitat (Ruggerio *et al*. 1991), including a breeding pair of Queen Charlotte Goshawks (Table 1).

Table 1. Some animal species observed in an 80 year-old second-growth forest.

Queen Charlotte Goshawk, *Accipiter gentilis ssp. laingi*	Red-listed, successful nesting observed, considered indicative of old-growth
Western Screech Owl, *Otus Kennicotti saturatus*	Blue-listed, indicative of old-growth
Pileated Woodpecker, *Dryocopus pileatus*	Associated with cedar snags
Blue Grouse, *Dendragapus obscurus*	Breeding habitat
Cougar, *Puma concolor*	Frequent observations, preys on deer
Wolf, *Canis lupus*	Sporadic occurrence
Roosevelt Elk, *Cervus elaphus roosevelti*	Blue-listed, beds, feeds in clear-cuts
Black-tailed Deer, *Odocoileus hemionus*	Common, browses on shrubs
Black Bear, *Ursus americanus*	Feed and migrate through
Pine Marten, *Martes americana*	Considered indicative of old-growth
Wolverine, *Gulo gulo ssp. vancouverensis*	Blue-listed, indicative of undisturbed habitat

The Gold Standard—The Original Old-growth Forest

The motives for this research were simple curiosity about the Study Landscape's old-growth forest and plant communities prior to logging and fires of 80 years ago, and the potential application of this information as a *Gestalt* to guide long-term woodland management. The naivety of the question should have been a warning about the difficulty of the research. Rather than finding a useful "off the shelf" description, it soon became apparent that current research into old-growth Douglas fir forests was emphasizing both diversity of structural complexity and developmental pathways (Winter *et al*. 2002) and the importance of site specificity (Blackwell et al. 2002). Because the Study Landscape was located at the northern margin of the dry coastal Douglas fir forest zone (with less than ideal site qualities for growing timber), there was little published data on research on comparable sites. My research program expanded to include studying evidence on the ground (including old stumps and the regenerated second-growth forest); discussions with local foresters; use of old records, photographs and naturalist reports; and field surveys to identify possible undisturbed sites with similar age-classes and tree species and site qualities matching the historical unlogged conditions of the Study Landscape.

The on-site evidence—western red cedar and Douglas fir stumps measuring 80-125 centimetres in diameter and surviving Douglas fir veteran trees—confirms old records of a predominately Douglas fir forest, with significant representation of western red cedar, western hemlock and western white pine (Mackie 2000). Tree ring analyses on western hemlock veterans growing in an unburnt site (devoid of charcoal in the soil profile, no burnt stumps) indicate they were present in the understory prior to being released by logging 80 years ago.

Using the above data, efforts were made to identify and locate old-growth sites with comparable aspects and elevations to the Study Landscape. Field work centred on Buttle Lake within Strathcona Provincial Park. The valley, running in a north-south direction west of Forbidden Plateau, still lies within the Georgia Basin Ecosystem watershed. Like the Study Landscape, it has a summer-dry and winter-wet climate moderated by an ice-free lake; persistent higher elevation snow pack; eastern exposures; and warm south-facing sites. A candidate site was identified and a non-intrusive photographic inventory was undertaken. The next research stage was to identify any extant field studies of the low elevation forest vegetation in Strathcona Provincial Park.

Fortunately such a study was found. In 1974 Vladimir Krajina, who developed both BC's biogeoclimatic classification system and ecological reserves, and a graduate student researched the Coast Western Hemlock (dry sub zone) in Strathcona Provincial Park (Kojuma *et al.* 1974). They carried out detailed vegetation inventories, soil profiles and tree ring analyses on 99 homogeneous and undisturbed plots. Several of their plot sites matched my required criteria (elevation, aspect, moisture, etc.) corresponding to sites within the Study Landscape. Krajina and Kojuma found that at the macro-area level, Douglas fir was the dominant tree up to 850-1,000 metres elevation. Most of the trees were found to be between 200-300 years old with some attaining diameters over 150 centimetres (d.b.h.) and 70 metres in height. While Douglas fir was described as the climax species on dry sites, the authors concluded that it would be replaced as the climax species by western hemlock on sites with better moisture regimes and by western red cedar on wetter sites. The detailed plot inventories from the Krajina and Kojuma study will serve as an invaluable source of information to be used in future research characterizing the original plant communities in the Study Landscape. The study also confirms the author's own observations that the Environment Canada's 1998 Sensitive Ecosystem Inventory (Ward *et al*. 1998) excluded large areas of significant and intact ecosystems which have strong affinities with the coastal lowlands of south eastern Vancouver Island. For example, Krajina found arbutus (*Arbutus menziesii*) in a *Pseudostuga menziessii-Pinus contorta/Rhacomitiium canacesens* plant community. This Douglas fir/shore pine/rock moss is a red-listed plant community.

Recent Research on Old-growth Development and Application to the Study Landscape

Some researchers are now suggesting that ecological values need not be sacrificed if second-growth is actively managed towards characteristic old-growth diversity, an optimal ecosystem strategy compared to either protection or maximizing the value of wood production (Carey 1998). Further, recent studies are leading towards a more dynamic, varied and complex characterization of old-growth Douglas fir forests developing through multiple pathways (Blackwell *et al.* 2002; Spies *et al*. 2001). What applications might this research have for small woodlands? Biodiversity management prescriptions for small landowners tend to be simplistic and restricted to habitat and plant community preservation (see McPhee *et al*. 2000 for an example).

One of the interesting ecological characteristics of the Study Landscape is its age and structural complexity (descriptions here are restricted to the reference 40 acre woodland). Although the overall age-class is less than 80 years, older Douglas fir and western red cedar survive as veteran trees or exist as snags or as remnants in coarse woody debris. While the canopy is generally closed, western hemlock infected by wind-thrown mistletoe are currently opening up patches that are stocked with juvenile western white pine and Douglas fir and amabilis fir. Degraded soil on old railroad grades is identifiable on dry sites by salal and on wet sites by alder. At an average elevation of 400 metres (with an average slope of 30% and an eastern aspect), the woodlot is on a line of sudden transition where winter snow packs reaching 1 metre in depth cause structural damage to susceptible tree species. With generally dry, nutrient poor soils there is a summer water deficit, except along seasonal creeks and in depressions. Fire affected the southern half of the site in 1925, with important impacts on the present forest cover. Re-seeded Douglas fir dominates the burnt-over site; while on the unburnt half, an understory of western hemlock released after logging in 1925 now dominates. The western hemlock, although by definition the climax species, is stressed on dry sites and by snow load throughout and the trees have become infected by dwarf mistletoe and could be naturally supplanted over time by western red cedar with some western white pine and true firs. Moisture deficits on the dry sites have also caused western red cedar snags to develop. Throughout, western red cedar and western hemlock are the dominant understory species. On the best bottom sites are 75-year-old Douglas fir, western hemlock, western red cedar and western white pine, all attaining 80 centimetres in diameter. The presence of amabilis and sub-alpine fir reflect a montane influence.

Recent literature on old growth brings two issues in mind. First, are there descriptors or indicators of old-growth attributes that are readily applicable to a small woodland and of utility to a non-professional, non-scientific user? Second, is it possible to influence the development pathway in the undisturbed second-growth forest in the Study Landscape towards old-growth characteristics?

There is no simple attribute to establish old-growth criteria. The BC Forest Services uses 150 years or older as a working definition for old-growth coastal Douglas fir forests (Blackwell *et al.* 2000). Although this seems suspect if wide ecological values are considered. Could plant species be useful indicators? Table 2 presents four species suggested as being associated with recovery in longitudinal research on second-growth Douglas forests in Oregon (Halpern 1989). Three of the four species were found in the Study Landscape, suggesting either that it is developing old-growth characteristics or that the species are not suitable indicators.

Table 2. Indicators of disturbance recovery in clear-cut/burnt Douglas fir forest.

SPECIES FAILING TO RE-COLONIZE 21 YEARS AFTER DISTURBANCE (Oregon Study/Halpern)	**UNDISTURBED 200-300 YEAR-OLD FOREST** (Strathcona Park/Krojima)	**80 YEARS AFTER DISTURBANCE** (Author's Study)
Rattlesnake Plantain, *Goodyera longifolia*	present	present
Twin Flower, *Linnea borrealis*	present	present
Western Yew, *Taxus brevifolia*	present	present
Prince's Pine, *Chimaphila umbellata*	present	absent

A recent chronosequence study of forest regeneration and old growth on southern Vancouver Island offers a more sophisticated insight into the importance of understanding development pathways. Undertaken by the Canadian Forest Service (Blackwell et al. 2002), it included Coastal Western Hemlock (very dry) sites. Plots were analysed at three different stages of maturity (3-8 years, 25-45, and 65-86) with an "old-growth" control plot. Table 3 summarizes some key characteristics of old growth. Applying them to the reference woodland studied by the author lends support to the conclusion by Blackwell et al. that there is overlap between mature and old growth plots for some old-growth attributes. On the other hand they observed that the wide stand variation characteristic of old growth (tree-diameter, crown depth, basal area, and number and biomass of snags) takes longer to develop especially on low-productivity sites. This latter finding is identified as an especially critical issue for enhancing ecological values, as the minimum harvest age on public lands of coastal second-growth has been decreasing. This finding also confirms the author's intuition, and the professional view of Allan Hopwood, that an optimal strategy to manage woodland towards old growth requires retention of older age classes of Douglas fir.

One of the challenges in developing old-growth characteristics is that Douglas fir is not a dominant climax species, instead establishing after extensive fire disturbance (Kojima *et al*. 1974). This has been presented as a special case in old-growth management where single-tree selection is not regarded as a biologically viable option in "normal" (i.e. industrial forestry) practices (Klinka 1990). Instead patch-cut or group-selection methods are recommended. However, we should not assume that management practices developed for industrial forestry are appropriate or the only alternative for small woodlands, where the stands are small and intensive hands-on management is an option (i.e. in controlling understory vegetation). Practices such as variable density thinning, which successfully mimic natural processes and result in faster ecosystem and landscape recovery (Spies *et al*. 2001), can be implemented in woodlands even if not cost effective for industrial forestry. Table 4 summarizes differences in management practice opportunities between small woodlands and industrial forestry.

Table 3. Comparison of Study Landscape against checklist of old-growth attributes for Coastal Western Hemlock (dry sub zone) (modified after Blackwell *et al* and others).

ATTRIBUTE	OLD-GROWTH	STUDY AREA
DOMINANT SPECIES	Douglas fir	Western Hemlock/Douglas fir
AGE	> 250 years	80 years
CANOPY	Multilayered	Multilayered
STEM DIAMETER d.b.h.	20+stems/ha. >80 cm	5+ stems/ha >80 cm
SNAGS/HECTARE	4+ >50 cm. d.b.h.	4+ >50 cm. d.b.h.
COARSE WOODY DEBRIS	Present	Extensive
VEGETATION	Patchy Distribution	Patchy Distribution

Ecosystem Diversity and Small Woodland Forestry Management

While older second-growth forests are now being recognized for their importance in the eco-system, management prescriptions for landowners tend to be limited, principally recommending protecting unique plant communities or patches of wildlife habitats through mechanisms such as legal covenants or land conservation. Yet because small woodlands are operated with multiple goals, they present an opportunity to address a range of ecological requirements of plants and wildlife requiring various conservation management measures, for example connected habitats, and gap phase or successional management. From an ecosystem perspective, the diverse ownership and management regimes within the Study Landscape is reflected in differences in disturbance and recovery: industrial forestry practices including replanted clear cuts and high grading of second-growth Douglas fir; unmanaged naturally regenerated second-growth; and even a professionally managed eco-certified forestry regimes. My hypothesis is that diversity in ownership and management positively correlates with biodiversity values.

Table 4. Comparing management opportunities for small woodlands and industrial forestry.

ISSUE	SMALL WOODLAND	INDUSTRIAL FORESTRY
SIZE OF LANDSCAPE	small size limits effective habitat and ability to protect sites	large size improves wildlife habitat opportunities
MANAGEMENT OBJECTIVES	multiple objectives: aesthetic, ecological, financial	maximize net present value and financial return, regulatory requirements
FOREST MANAGEMENT	tends to be labour intensive, but inefficient	capital intensive
INVENTORY	time and interest permits "micro-detailing" but constrained by limits on expertise	top down and survey methodologies limit details of knowledge
REGULATION	largely laws of general application, i.e. Fisheries Act, Wildlife Act	detailed forestry management requirements on public lands, less so on private lands
DECISION MAKING	high degree of control to optimize values but wrong decisions can be costly ecologically and financially	responsible to corporate, professional interests determined by markets, regulations, etc.

Ecological complexity and diversity is also a function of the disturbance history. Differences in disturbance (burnt/not burnt, soil disturbance from railroad logging, etc.), topography, and site growing qualities, combined with natural regeneration has accelerated the structural differentiation of the landscape. For example, in old growth Coastal Western Hemlock (dry zone) with this aspect and topography, vegetation varies most under mesic influence (Kojima *et al.* 1974). Because logging practices of 80 years ago and the resulting natural generation were both sub-optimal, considerable decadence developed and continues to manifest itself. The legacies include veteran trees, snags, coarse woody debris, and disease (e.g. dwarf mistletoe infected western hemlock, laminated root rot, etc.).

Recognizing that a small woodland within this landscape can have high ecological values, what can we say about managing it to retain or even enhance biodiversity? The concept of old growth is ambiguous, as much a cultural term as one based in science (Spies *et al*. 2001). Nevertheless, old growth can serve as a potent symbol to guide small woodland management. The typical woodland owner is neither a forestry professional nor has much access to practical guidance, and is conservative in making management decisions (NIWA 1994). It should not be assumed that management prescriptions developed for industrial forest operations are appropriate for small woodlands even if the directional indicators are similar (increased complexity of structure, large trees, snags, large diameter woody debris, canopies of multiple heights and closures, complex spatial mosaics of vegetation). Forest practice research on old-growth development seems to be directed to optimizing complexity in forest structure, while the woodland owner needs straightforward management objectives and advice, which are presently unavailable. Furthermore, the small woodland owner manages for a broad range of values such as environmental conservation, wildlife viewing, aesthetics, recreation and financial returns (Schaan 2002). Interestingly financial goals are most often not short-term returns but the long term appreciation of timber values, which is very compatible with developing old-growth characteristics.

The Guiding Hand of the (Non)market

There is an unfortunate tendency within the conservation movement to put a positive "spin" on small-scale eco-forestry without reference to economics (see Loomis 1990 as an example of this). Yet market economics are critical to maintaining sustainable forestry practices (Jagger *et al* 1997) and to the prospects for accelerating the development of characteristics of the pre-existing old-growth Douglas fir forests in second-growth stands. While low log prices might seem advantageous because they encourage benign neglect, they do not encourage optimal conservation management. Unfortunately, the current price structure for logs in Coastal British Columbia mitigates against developing old-growth characteristics. It presently costs about $40 a cubic metre for selective logging. With pulp log prices of $25 to $40 and coastal mills demanding saw logs with top diameters over 8 inches, it is often uneconomical to carry out management activities, such as thinning, required to optimize old-growth development. On the other hand, there are good returns in logging second-growth export grade Douglas fir ($150 cu. m.) even though these are the very trees that should be retained if the objective is to work towards old growth. This situation is a result of the absence of a competitive log market on the BC Coast where large operators are geared to feeding their own mills and to log export.

Conclusion

Small woodlands on Vancouver Island presently play an important role in maintaining biodiversity within the Georgia Basin ecosystem. Their ecological values will be enhanced if management techniques that successfully mimic natural processes and result in faster ecosystem recovery are encouraged. Programs to support small woodland owners in implementing the development of old-growth Douglas fir characteristics are non-existent, even as the current market conditions are putting maturing second-growth Douglas fir stands at risk.

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